

REMARKS

This responds to the Office Action mailed on January 20, 2004.

Claims 1, 13, 17, 25 and 31 are amended, claim 16 was previously canceled, and no claims are added; as a result, claims 1-15 and 17-41 are now pending in this application.

Interview Summary

An interview was conducted with Examiner Thompson on January 14, 2004 regarding the omission of the Jones document from the Form PTO-892 attached with the Office Action dated December 5, 2003. The Examiner agreed to issue a Supplemental Office Action in order to include the Jones document, and to re-start the time period for response based upon the mail date of the Supplemental Office Action.

Claim Objections

The Examiner objected to claim 17 because of the following informalities: claim 17 depends on a canceled claim 16. With this amendment Applicant has amended claim 17 to be dependent on claim 13. The Examiner is respectfully requested to reconsider the objection to claim 17.

§103 Rejection of the Claims

Claims 1-15 and 17-41 were rejected under 35 USC § 103(a) as being unpatentable over JP Patent No. 10-189841 (hereinafter Japan '841) in view of Jones (U.S. 6,219,241).

The Examiner argued that Japan '841 discloses a substrate 4 having at least one hole 4a, a heat sink (plate) 2 with fins 2a having at least one leg 3 and a heat producing component 5 attached to substrate (printed board) 4 where the sink 2 is disposed over the component 5 with a thermal interface material 6 disposed between the sink 2 and component 5¹. The leg 3 is

¹ Applicant notes that the Office Action in discussing "Japan" did not accord the reference characters the same meaning that Japan did. According to the English Abstract, 4 is the "electronic part" rather than a "substrate", 5 is a "radiator fixing hole" rather than "a heat producing component" 6 is a "pattern" rather than a "thermal interface

extending beyond the hole 4a soldered to the hole 4a in Fig. The Examiner notes that the leg 3 is straight and appears to be rectangular shaped, and is not shown or taught as a cylindrical pin.

The Examiner then cites Jones as showing a sink 30 with a cylindrical shaped pin 38.

The Examiner then concludes that it would be obvious to one skilled at the time of the invention to construct the shape of leg 3 of Japan '841 into a cylindrical pin shape as taught by Jones to provide ease of alignment and mounting to board 4 thus providing a stable mounted sink 2 using less restate (footprint) on substrate 4 to provide excellent heat enhancement during thermal cycling in a low cost assembly.

The Examiner admits that Japan '841 does not teach or suggest the use of the well known wave soldering process or reflow process done by a machine to attach the sink to the board and to preheat and couple the sink to the component with the thermal material to provide assembly. However, the Examiner considers it obvious to one skilled at the time of the invention to use the well known processes of the machine to solder pin 3 to board 4 and couple sink 2 to component 5 in one process to save time, money and materials to provide attachment and thermal enhancement by providing a low cost thermal attachment solution.

The Examiner further stated that Japan '841 does not teach nor suggest the well known thermal material or grease as material 6. However, the Examiner held that to one skilled at the time of the invention it is considered obvious to use this well known material of thermal grease as material 6 to provide excellent attachment and thermal enhancement to avoid component 5 breakdown using a low cost thermal solution.

The Examiner further stated that Japan '841 does not teach nor suggest what type of component 5 is. However, the Examiner held that to one skilled at the time of the invention it is considered obvious that component 5 be the well known microprocessor to process information and be thermally cooled to avoid breakdown.

The Examiner further stated that Japan '841 does not disclose the well known material of Al for thermal enhancement. However, the Examiner held that it would be obvious to one skilled to use the well known material of Al for excellent thermal enhancement to avoid component breakdown using a low cost material.

Regarding the method claims, the Examiner stated that the broad method steps are fully covered by the detailed discussed above, contending that the language of mounting, positioning, aligning, reducing, attaching, loading, preheating, cooling, wave soldering, forming, positioning mounting and disposing add no specific detailed method steps that are patentable over the discussion above.

With this amendment each of the independent claims have been amended to more clearly define the present invention and to include: that a heat source is operatively coupled for a predetermined time to at least the at least one mounting pin to effect substantially simultaneous attachment of the at least one mounting pin to the substrate and attachment of the thermal interface material to the heat sink and to the heat-producing component (claim 1); and attaching the heat sink in a fixed position on the heat-producing component and the substrate by soldering the at least one mounting pin into the at least one hole of the substrate and to substantially simultaneously heat the thermal interface material to produce the necessary thermal coupling between the heat producing component and the heat sink (claim 13, also see amended claims 31 and 25).

The Japan '841 disclosure does not disclose or suggest attaching the heat sink in a fixed position on the heat-producing component and the substrate by soldering the at least one mounting pin into the at least one hole of the substrate while continuing to heat the thermal interface material to produce the necessary thermal coupling between the heat producing component and the heat sink. Jones has only been cited as teaching a cylindrically shaped pin. Therefore, no combination of these references would result in the claimed invention as set forth in the amended claims.

It is taught in the present specification that in a typical wave soldering machine, the thermal interface material 910 is exposed to temperatures of more than 70⁰C for a period of 15 to 25 seconds over the pre-heaters, and further the thermal interface material 910 is exposed to temperatures above 80⁰C for a period of 8-12 seconds over the solder wave (when the mounting pin is soldered to the substrate). This is generally sufficient to melt the thermal interface material 910 and wet the back side 940 and the heat sink 600 to produce the necessary thermal coupling between the heat producing component 130 and the heat sink 600.

AMENDMENT UNDER 37 C.F.R. 1.116 – EXPEDITED PROCEDURE

Serial Number: 09/897320

Filing Date: June 29, 2001

Title: ELECTRONIC ASSEMBLY WITH SOLDERABLE HEAT SINK AND METHODS OF MANUFACTURE

Applicant: Intel Corporation

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With the amendment to the claims and for the reasons set forth above, Applicant believes that the rejection of the claims under 35 USC § 103 has been overcome. The Examiner is therefore respectfully requested to reconsider the rejections of the claims under 35 USC § 103.

Conclusion

The prior art made of record and not relied upon is considered to be of general interest only. Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's below-named representative at (612) 373-6970 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

GEORGE HSIEH

By his Representatives,

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Date

May 20, 2004

By

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 20 day of May, 2004.

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